WASHINGTON STATE DEPARTMENT OF
Natural Resources
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Brief Summary of Ecological Integrity Assessments

What is an Ecological Integrity Assessment?

- Methodology used by NatureServe/Natural Heritage Network to assess ecological integrity/condition[1] of an occurrence of a plant association or ecological system

- EIA is a multi-metric index designed to document degradation of key biotic and abiotic attributes along a continuum from reference to degraded.

- Ecological Integrity Assessments are developed using the following steps; we:
  1. outline a general conceptual model that identifies the major ecological attributes, provide a narrative description of declining integrity levels based on changes to those ecological attributes, and introduce the metrics-based approach to measure those attributes and assess their levels of degradation.
  2. use ecological classifications at multiple classification scales to guide the development of the conceptual models, allowing improved refinement of assessing attributes, as needed.
  3. use a three level assessment approach – (i) remote sensing, (ii) rapid ground-based, and (iii) intensive ground-based metrics – to guide development of metrics. The 3-level approach is intended to provide increasing accuracy of ecological integrity assessment, recognizing that not all conservation and management decisions need equal levels of accuracy.
  4. identify ratings and thresholds for each metric based on "normal' or "natural range of variation" benchmarks.
  5. provide a scorecard matrix by which the metrics are rated and integrated into an overall index of ecological integrity.

- Concept of the natural range of variation (NRV) is based on the temporal and spatial range of climatic, edaphic, topographic, and biogeographic conditions under which contemporary ecosystems evolved. When historical anthropogenic interactions with ecosystem occurred over spatial and temporal scales in which native biota were able to adapt, they would be included as part of NRV (i.e. Native American burning of prairies in western Washington and Oregon).

- Metric Ratings document deviation of each metric from its natural range of variation; ideally, measurements of each metric are collected from sites exposed to various degrees of human-induced disturbance ranging from those possessing minimal impact to those highly degraded by human activity, providing an ecological dose-response curve from which to assess the relationship between each metric and human disturbance. Initial EIA models, however, are often based on data from literature sources and/or professional judgment. Metric ratings are updated as new data becomes available. Qualitative statements or quantitative thresholds are used to

[1] Ecological integrity, as used for the EIA, is defined as "an assessment of the structure, composition, and function of an ecosystem as compared to reference ecosystems operating within the bounds of natural or historic disturbance regimes"

further define these ranks for individual metrics while ensuring that those statements/values conceptually reflect standard definitions of each rank category:

1. **A Rank** – metric/ecosystem is functioning within the bounds of NRV. Characteristics include: the landscape context contains natural habitats that are essentially unfragmented and with little to no stressors; the size is very large or much larger than the minimum dynamic area; vegetation structure and composition, soil status, and hydrological function are well within natural ranges of variation, exotics (non-natives) are essentially absent or have negligible negative impact; and, a comprehensive set of key plant and animal indicators are present.
2. **B Rank** – landscape context contains largely natural habitats that are minimally fragmented with few stressors; the size is large or above the minimum dynamic area, the vegetation structure and composition, soils, and hydrology are functioning within natural ranges of variation; invasives and exotics (non-natives) are present in only minor amounts, or have or minor negative impact; and many key plant and animal indicators are present.
3. **C Rank** – the landscape context contains natural habitat that is moderately fragmented, with several stressors; the size is small or below, but near the minimum dynamic area; the vegetation structure and composition, soils, and hydrology are altered somewhat outside their natural range of variation; invasives and exotics (non-natives) may be a sizeable minority of the species abundance, or have moderately negative impacts; and many key plant and animal indicators are absent. Some management is needed to maintain or restore[2] these major ecological attributes.
4. **D Rank** – the landscape context contains little natural habitat and is very fragmented; size is very small or well below the minimum dynamic area; the vegetation structure and composition, soils, and hydrology are severely altered well beyond their natural range of variation; invasives or exotics (non-natives) exert a strong negative impact, and most, if not all, key plant and animal indicators are absent. There may be little long-term conservation value without restoration, which may be difficult or uncertain.

Applying the Ecological Integrity Assessment

- EIA can be applied at three levels of intensity depending on the purpose and design of the data collection effort:
  1. **Level 1** – relies almost entirely on Geographic Information Systems (GIS) and remote sensing data to obtain information about landscape integrity and the distribution and abundance of ecological types in the landscape or watershed
  2. **Level 2** – uses relatively rapid field-based metrics that are a combination of qualitative and narrative-based rating with quantitative or semi-quantitative ratings. Field observations are required for many metrics, and observations will typically require professional expertise and judgment
  3. **Level 3** – requires more rigorous, intensive field-based methods and metrics that provide higher-resolution information on the integrity of occurrences within a site. They often use quantitative, plot-based protocols coupled with a sampling design to provide data for detailed metrics

Below are general guidelines as to how a Level 2 or 3 EIA would be used to assess ecological integrity of a particular site:

Step 1: Assemble background information about the management and history of the site.

Step 2: Classify the site using *Draft Field Guide to Washington's Ecological Systems* (Rocchio and Crawford 2008) to ensure that the correct EIA is used.

Step 3: Determine the extent and size of the ecological system.

Step 4: Determine the boundary and estimate the size of the assessment area (if it is not the same as the ecological system occurrence) and allocate observation points or plots (if plots or points are to be used).

Step 5: Establish the landscape context boundary for the occurrence

Step 6: Verify the appropriate season and other timing aspects of field assessment.

Step 7: Consult metric protocols to ensure they are measured systematically

Step 8: Conduct the office assessment of stressors, landscape context and on-site conditions of the assessment area.

Step 9: Conduct the field assessment of stressors and on-site conditions of the assessment area.

Step 10: Complete assessment scores and QA/QC Procedures.

A general note of caution: ecosystems are far too complex to be fully represented by a suite of key ecological attributes, indicators, and metrics. As such, our efforts to assess ecological integrity are approximations of our current understanding of any ecosystem which means the metrics, indices and scorecards presented are left flexible to allow change over time as our knowledge grows.

For more information, contact the Washington Natural Heritage Program
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Also see: http://www1.dnr.wa.gov/nhp/refdesk/communities/eia.html